captivity and suffering. Ceballos, the sole survivor, was a prisoner for five months. M. Thonar, with his party, visited the scene of the massacre and traversed the mysterious regions of the Chaco with only the loss of a single man, spite of the hostile attitude of the Indians.——Mr. Chas. Winnieke has succeeded in exploring and mapping about 40,000 square miles of previously unknown country in Australia. Distances of from 200 to 300 miles had to be traversed across the highest sand ridges before water could be obtained.——Mr. O'Neill, who arrived at Mozambique Feb. 4, after having traversed 1400 miles of unexplored country between that place and Lake Nyassa, has discovered Lake Amarambu, the existence of which was previously unknown. He reports Lake Shirwa to be smaller than has been represented. On his return he followed the Likelungo valley, which he found to be well peopled.

GEOLOGY AND PALÆONTOLOGY.

THE MASTODONS OF NORTH AMERICA.—There are probably nine species of the genus Mastodon which may be clearly distinguished as former inhabitants of North America. The genus first appears in the Ticholeptus beds and continues to, if not into, the human period. The statement that this genus occurs in the White River formation is erroneous.[1] The oldest species is probably the *M. proavus* Cope. The Loup Fork epoch contains the remains of eight of the nine species, while one only, the *M. ohioticus* Cuv., is characteristic of later ages.

The following table expresses the characters of these species in analytical form:

I. Intermediate molars with not more than three crests.

α. Crests acute, transverse.

β. Valleys uninterrupted.

Last superior molar with three crests and a heel; crests low not serrate . *M. proavus.*
Last superior molar with four crests and a heel; crests elevated not serrate *M. ohioticus.*

ββ. Valleys interrupted.

Edge of crest tuberculate ..... *M. serridens*

αα. Crests transverse, composed of conic lobes.

β. Valleys ? uninterrupted.

Last inferior molar narrow, with four crests; no accessory tubercles . . . *M. shepardi.*

β. Valleys interrupted.

Last inferior molar with four crests and a heel; symphysis short, M. .150; smaller size ..... *M. euhypodon.*
Last inferior molar with four crests and a cingulum; symphysis longer, M. .280; size medium ..... *M. productus.*
Last inferior molar with five crests and a heel; symphysis very long, M. .450; size largest ..... *M. angustidens.*

" *ααα*. Crests broken into conic lobes; those of opposite sides alternating.

Last inferior molar narrow, supporting four crests and a heel ..... *M. obscurus.*"

[1] See Report of the U. S. Geological Survey of the 40th parallel, Vol. I, p. 412.

II. Intermediate molars with four transverse crests.

A long symphysis; crests well separated, tubercular, with accessory lobes interrupting valleys ..... *M. campester.*

Symphysis very short; crests thick, closing valleys by contact; no accessory cusps; (Leidy) ..... *M. mirificus.*

The following notes may be made on these species:

M. proavus Cope.—The two crested molars of this species are nearly twice as large as those of *M. ohioticus*, leading to the supposition that some of them may belong to the "intermediate" series. This is confirmed by the small number of crests of the last superior molar of an individual from the Ticholeptus beds, which has only three crests and a heel. This molar is a good deal like the corresponding one of the *M. borsoni*, figured and described by Vacek, but differs in the smaller number of crests and in the expansion of the inner base of the external half of each crest, which thus gives a triangular section on wearing. A femur indicates that this is one of the largest species of the genus.

M. ohioticus Cuv.—Probably a descendant of the preceding, which represents it in earlier periods.

M. serridens Cope, sp. nov.—Founded on a first or second true molar from Texas. It is peculiar among American species in its acute elevated, entire crests, with tuberculo-serrate edges. It thus resembles the *M. turicensis*, but differs in well-developed longitudinal crests at the inner end of the external half of the crests, which consist of two tubercles on the posterior side of a crest, and on the anterior side of the next succeeding crest. Strong anterior and posterior cingula; edge of each cross-crest with six or seven tubercles. Length of crown, M. .130; width, .080; elevation, .061. Length of *M. ohioticus*, but narrower. Found by Henry Brous, M.D.

M. shepardi Leidy.—This species is apparently distinct from *M. obscurus* Leidy, but its distinction from *M. humboldti* has not yet been ascertained. California.

M. euhypodon Cope, sp. nov.—Founded on a nearly perfect left mandibular ramus with last molar tooth and tusk, with entire palate with both last molar teeth and tusks. The superior tusks are small and have an enamel band, and the inferior tusks are large and have an enamel band. Superior tusks compressed; inferior cylindric. The jaws indicate a small species, but the molar teeth are as large as those of the larger American form of *M. angustidens*, and as long as that of *M. ohioticus*, but narrower. Its symphysis is not prolonged. Length of ramus posterior to symphysis, M. .500; of last lower molar, .182; width of do., .75. The mental tusk is much larger than that of *M. productus* or *M. angustidens*. Diameter of its alveolus, .068. Kansas, Frank Hazard.

M. productus Cope.—Loup Fork Beds of New Mexico.

M. angustidens Cuv. var.—Lower jaws of four individuals, two of which are nearly complete, show that this species is found in

North America under a slight modification of form. The only difference between our specimens and those of Europe is the greater size of the heel of the second true molar, which is really tetralophodont. It is a larger species than the last two. The best preserved ramus measures M. 1 080 in length, of which .420 is symphysis. Loup Fork beds of Kansas, Nebraska and Dakota.

M. obscurus Leidy.—This species rests on a lower last molar of uncertain origin. Its relations have yet to be determined.

M. campester Cope.—This very distinct species was found in the Loup Fork beds of Kansas by Dr. R. S. Hill, and described by me in 1879, in the Proceeds. Amer. Philos. Soc.

M. mirificus Leidy.—From the Loup Fork beds of Nebraska, found by Dr. Hayden. Resembles most the *M. atticus* Wagn., in dentition.—*E. D. Cope.*

MARSH ON DIPLODOCUS.—In a late number of the *American Journal of Science and Arts*, Professor Marsh describes such parts of the osteology of the genus Diplodocus as are at his disposal. The genus is referred to the Dinosauria, where it enters the division Opisthocœla. It is remarkable in the position of the external nares, which are superior, and between the orbits. The muzzle is declivous in the typical species, *D. longus*, and the teeth are few and slender, and are confined to the anterior parts of the jaws, the maxillary bones bearing but few of them. Two species of the genus are described by Marsh, *D. longus* and *D. lacustris*. The former was probably forty or fifty feet in length.

Professor Marsh believes that the *Diplodocus longus* was a terrestrial animal, and lived on the foliage of forest trees. The character of the dentition indicates soft food, and one not requiring mastication. They might be described as a pair of opposed rakes, like oyster-tongs. The position of the nostrils above the orbits is eminently characteristic of aquatic, and especially of marine animals. It confirms the view I expressed in this journal a few years ago in describing the *Amphicœlias fragilissimus*, that the species of the Opisthocœla were aquatic, and walked on the bottom; their cavernous vertebræ, containing diverticular pneumatic floats, and their solid legs and tail acting as anchors.—*E. D. Cope.*

LITHOLOGY OF SOME CORDILLERIAN VOLCANOES.—A recent article by Messrs. Hague and Iddings (*Amer. Jour. Science and Arts*, September, 1883) gives the results of a study of the volcanic rocks of Lassen's peak, Mts. Shasta, Hood, and Rainier. These cones are andesitic volcanoes, with extrusions of basalt along the slopes and base, and the greatest similarity is said to exist in their lavas. The rocks are classified as basalt, hypersthene andesite, hornblende andesite, and dacite.

The basalt occurs as a light to dark gray rock, sometimes vesicular, and presents macroscopically only small olivine crys-

tals. Microscopically this rock is seen to be composed of ledge-formed plagioclase, irregular grains of light brownish-green augite, colorless olivine, magnetite, and glass. The hypersthene andesite is generally a porous, sometimes pumiceous, rock, varying in color from blue-black to steel-gray, but sometimes red or reddish-gray. Inclosed in the ground-mass are numerous porphyritic feldspar crystals, with some augite and hypersthene. Microscopically the rock is seen to be composed of plagioclase, augite, hypersthene, magnetite, and a glassy base sometimes globulitic, more often filled with microlites of feldspar and pyroxene, and magnetite grains. The hornblende andesite is arranged into two varieties: one near the hypersthene andesite, and resembling it in appearance and structure, but contains hornblende; the other consists chiefly of ledge-formed feldspars, minute pyroxenes, a little magnetite, with or without colorless glass, all inclosing porphyritic plagioclases and hornblendes.

The most interesting rock described is the dacite. This name is given to the rock styled by Richthofen, in 1867, *nevadite* or *granitic rhyolite*, of which Mr. C. King declared, in 1878, that it was "entirely made up of crystalline minerals, with only the slightest traces of vitreous binding material." He also classed it with the rhyolites. In 1881 the present writer pointed out that King was mistaken in his statements of the small amount of glass, and later referred the nevadite to the trachytes.

Hague and Iddings say that they can not regard the rock as in any sense entitled to be classed as a rhyolite, and that it is rich in a glassy base, so far agreeing with the present writer; but they class it under dacite (meaning a quartz-bearing andesite), a term of which he fails thus far to see any need in lithology. Our authors seem inclined to carry the term andesite in its subdivisions to the same extreme that Zabó does the word trachyte—a not unnatural proceeding on their part. The analyses that have been previously made indicate that nevadite belongs to the trachytes, instead of to the andesites. It is described by Messrs. Hague and Iddings as composed of a colorless glass full of gas cavities, through which are found relatively few microscopic crystals of plagioclase, hornblende, mica, pyroxene, magnetite, apatite and zircon, forming a ground-mass inclosing plagioclase, mica, hornblende and quartz, and rarely pyroxene.

The paper of Messrs. Hague and Iddings is in advance of the majority of lithological ones, inasmuch as it attempts to *describe the rocks*, and does not look upon them as small mineral cabinets, regarding which the observer has done his duty when he has described a few of the pretty minerals enclosed. Our authors find that all the above described rocks grade into one another—all possible forms existing between any two types—a view that, in the present writer's opinion, holds good for eruptive rocks of every age the world over. The distribution is given as follows:

Mt. Rainier.—Hypersthene andesite.

Mt. Hood.—Hypersthene and hornblende andesites.

Mt. Shasta.—Basalt, and hypersthene and hornblende andesites.

Lassen's Peak.—Basalt, hypersthene, hornblende, and quartz-bearing andesites (dacite or nevadite).

The paper, from the point of view of our authors and their method of study, is an excellent one, and they are to be congratulated on the results.—*M. E. Wadsworth.*

HEAT AND COLD IN GEOLOGY.—A change of a few degrees in temperature between summer and winter, across the face of a continent, will make a surface expansion and contraction of one mile, every year. This cannot go on forever as an irresistible force without making some permanent changes. It may only affect the upper stratas so much, and it may be relieved by fissures somewhat. But in time fissures may be obstructed, either by minerals deposited from water, or by other means, so something must give way. The upper strata may be gradually compressed, or may slip upon those below. Elevations may slowly rise, or insupportable tensions may occur, causing earthquakes, or even volcanic action.

A less continuous and more striking result may come from the emergence of large areas from the sea. The ocean bed, especially where covered by arctic currents, must be of low temperature to a very considerable depth. Shutting out the arctic current would raise the temperature, and elevation from the sea would permanently raise it from ten to thirty degrees to a great depth. This, however gradual, would produce an expansion which would be irresistible and certainly produce great permanent changes, such as bending and elevation of strata. The bending and elevation might be toward one or both margins, where the cold and less elastic sea bed gave fixed resistance to further movement. Perhaps the lines of elevation would be at right angles to the lines of thrust across broad plains of expansion, to which they might be slightly curved. Such forms are shown in many if not all mountain systems, as if to point to the source of the expansion thrusts producing them. Indeed, such systems may be traced over the globe in such order as to apparently indicate various further laws and considerations affecting the action of this cause. This is a force that has not been duly recognized, which must have produced elevatory and other changes in all geologic ages with inexorable iron grasp, while ice and winds and waves, and streams and sea have worn away. I present it for discussion.—*Sam'l F. Wallace, Keokuk, Iowa.*

GEOLOGICAL NOTES.—*General.*—The Geological Survey Map of England and Wales is now completed; that of Ireland will be finished in a few years; but that of Scotland is far from complete. The work was commenced by Hy. T. De la Beche, at his own expense, and it was through his efforts and tact that the Geologi-

cal Survey was organized, and the Geological Museum and School of Mines established.

Silurian.—In a specimen of Asaphus, from the Black Trenton Limestone, Dr. Hy. Woodward has discovered what he believes to be the jointed palpus of one of the maxillæ, in the same position as is occupied by that organ in Apus, Serolis, etc. There appear to be seven articulations in the palpus above the basal joint. He states his opinion that the trilobites should be placed near to, if not actually in, the Isopoda-Normalia (Geol. Mag., Feb.). Dr. I. Mickleborough follows this with an account of a specimen of *Asaphus megistos*, in which ten pairs of jointed limbs are clearly seen.——Dr. Reusch, in a volume recently published at Leipzig, describes the Silurian fossils found by him in highly altered rocks in the Bergen peninsula, Norway. The shells of the fossils have disappeared, and only a reddish colored earth remains; yet the trilobites, Phacops and Calymene, and the corals, Cyathophyllum, Halysites, etc., with some graptolites, can be identified.

Triassic.—Herr H. Kunisch describes and figures (Zeit. der Deutsch. Geol. Ges., 1883) the adult stage of *Encrinus gracilis* from the Muschelkalk; and in a succeeding paper, Herr K. Picard describes and figures *Encrinus Beyrichii*, a new species from the Muschelkalk, near Sondershausen. All the joints of the stalk are pentagonal.——At a recent meeting of the Geological Society of London, Professor Owen described the skull and dentition of *Tritylodon longævus*, from South Africa. The teeth resemble those of *Microlestes*, from the Keuper of Würtemberg, and those of *Stereognathus*, from the Oölite.

Jurassic.—W. H. Hudleston (Geol. Mag., Feb., 1884) contributes some notes upon the Gasteropoda of the Oxfordian and Lower Oölites, and describes four new species of Cerithium.—— Professor Owen, at a recent meeting of the Geological Society of London, separated the Kimmeridgian *Plesiosuchus Mantelii* from the genus Steneosaurus, on account of certain peculiarities in the skull, teeth and vertebræ. It approaches nearer to the recent crocodiles than the older oölitic type.——J. W. Judd (*Nature*, Feb. 7) notes the undoubted occurrence, in a well bored at Richmond (Surrey, England), of a stratum of oölitic limestone eighty-seven and a half feet thick, with some subordinate clay bands, one of which was crowded with fossils of the age of the Great Oölite. Sandstone, evidently triassic, occurred under this stratum, and pebbles of Coal-measure sandstone, with fragments of anthracite, seem to indicate the presence of an anthracite bed below. The Jurassic and Triassic have never before been certainly identified as present below London, but this discovery shows that some anomalous strata found in other borings were really Jurassic.

Tertiary.—Herr W. Dames (Zeit. des Deutsch. Geol. Ges., 1883) describes *Cervus pentelici* and *Mus Gaudryi*, from the pliocene of Pikermi in Attica.——Restorations of the crocodilian *Diplocyno-*

don ratelii, and the turtle *Ptygogaster emydoides*, have been made for the museum of the Academy of Sciences of Paris. The remains from which the restorations have been made were put aside eighteen years ago by M. A. Milne Edwards, when he wrote his great work on fossil birds, and were taken, like most of M. Edwards' material, from the lower miocene of Saint-Gerand-le-Puy (Allier). Notwithstanding the smallness and great number of the pieces, M. Fischer has succeeded in joining together the head, all the vertebræ, some ribs, most of the members, and a great part of the bony plates of Diplocynodon, which M. Vaillant believes to be nearly related to Jacare.——In the Bulletin de la Société Geologique de France, Dr. Lemoine describes two casts of the brain mould of the crocodile *Thoracosaurus macrorhynchus*. These remarkable specimens are much like corresponding casts of the modern gavial, but present relatively rather smaller cerebral hemispheres.

Recent.—Herr D. Brauns (Zeit. des Deutsch. Geol. Ges., 1883) describes the diluvial mammals of Japan, and arrives at the conclusion that the geology, flora, pliocene molluscan fauna, and fossil land-fauna of Japan, prove that that country is most intimately connected with the Palæarctic region, and that it is only very recently that it has become a disrupted portion of the Eastern continent.

BOTANY.[1]

AN ENORMOUS PUFF-BALL.—My friend, Professor R. E. Call, has handed me a photograph of a puff-ball, the largest on record. The fungus was found by him in Herkimer county, N. Y., in 1877, and as it was impossible to preserve it, careful measurements were made, and photographs of it were taken. It was irregularly oval in outline, and much flattened, instead of approaching the spherical form, as is common in the large puff-balls. Its largest diameter was *five feet and four inches*, its smallest *four feet and six inches*, while its height was but nine and a-half inches. In referring to it Professor Call described it as "much larger than the largest wash-tub we had at home."

The specimen undoubtedly belonged to the species known as the giant puff-ball (*Lycoperdon giganteum*), and it was by far the largest of any of which I have been able to find measurements.—*C. E. Bessey.*

NOTES ON FUNGI.—Among the more interesting fungi are some of the various forms embraced in the genus Polyporus, of which over 1000 species have been described. The species of this genus are not as numerous as those of the genus Agaricus, of which the common mushroom is a well-known type, but they are not less interesting in the great variety of the forms they assume and in the universality of their diffusion. The Polypori most commonly noticed are probably those growing on dead trees or logs,

[1] Edited by PROF. C. E. BESSEY, Ames, Iowa.